REVISION OF *LOBELIA* SECT. *SPEIREMA* (CAMPANULACEAE: LOBELIOIDEAE)

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ABSTRACT

Lobelia sect. **Speirema,** endemic to southeastern Asia, is a group of large lax perennial herbs with solitary axillary flowers, sub-bilabiate corolla, baccate fruit, and reticulate seeds. Study of morphological characters in a set of representative and type specimens supported recognition of *L. fangiana*, *L. longipedicellata*, and *L. montana*, but not *L. brevisepala*, *L. reflexisepala*, or *L. wardii*; these last three are treated here as synonyms of *L. montana*. In addition, *L. deleiensis* is resurrected from the synonymy of *L. montana*, as it may be distinguished by a suite of floral characters that is assumed to confer reproductive isolation.

RESUMEN

Lobelia sect. **Speirema,** endémica del sureste de Asia, es un grupo de hierbas perennes grandes y laxas con flores solitarias axilares, corola sub-bilabiada, fruto baccáceo, y semillas reticuladas. El estudio de caracteres morfológicos en un conjunto de especimenes representativos y tipos permite el reconocimiento de *L. fangiana*, *L. longipedicellata*, y *L. montana*, pero no de *L. brevisepala*, *L. reflexisepala*, o *L. wardii*; estas tres últimas se tratan aqui como sinónimos de *L. montana*. Además, *L. deleiensis* se resucita de la sinonimia de *L. montana*, ya que puede distinguirse por un conjunto de caracteres florales que se asume que le confieren aislamiento reproductivo.

INTRODUCTION

The 415 species assigned to *Lobelia* L. (Lammers 2007a, 2010) make it the largest of the 29 genera in the Campanulaceae subfamily Lobelioideae (Lammers 2007b). Its infrageneric classification was revised recently (Lammers 2010), with recognition of 18 sections. Among those newly recognized was *L.* sect. *Speirema*, to which were assigned five species of southeastern Asia: *L. brevisepala*, *L. fangiana*, *L. longipedicellata*, *L. montana*, and *L. reflexisepala*. In the course of treating these species for the *Flora of China*, problems were encountered with their circumscription and characterization. As a result, this taxonomic revision was undertaken, the fourth in a series of such accounts for sections of *Lobelia* (Lammers 2000, 2004, 2007c).

TAXONOMIC HISTORY

The type of *Lobelia* sect. *Speirema* is *L. montana*, which was published in 1826 by Carl Ludwig Blume, director of the Buitenzorg Botanic Garden at what is today Kota Bogor, Indonesia. The species' description was drawn up from specimens collected in the mountains of Java by the garden's founder, Caspar Reinwardt. Blume's diagnosis was woefully brief, describing only the branched procumbent stems, serrate leaves, and solitary axillary flowers; no mention was made of the size of the plant, details of the flowers, or fruit type. As a result of this brevity, the species remained poorly known for some time. It was not mentioned at all by Don (1834) or Presl (1836), while Candolle (1839) was obliged to list it among "species minus notae aut generis dubii." Generic placement remained contentious and the species would peregrinate among four other genera before finally coming home to *Lobelia*.

In 1844, Justus Hasskarl, the assistant curator of Buitenzorg, reassigned *Lobelia montana* to the genus *Pratia* Gaudich. Though he did so without comment, one assumes that he had observed (either in nature or in cultivation) that the fruit was baccate rather than capsular, as this was the main distinction between *Pratia* and *Lobelia*.

Within *Pratia*, Hasskarl specifically assigned this species to an unranked taxon, *Bernonia* Endl. (Endlicher 1838; Brizicky 1969), which comprised Asian members of the genus with a bilabiate corolla. Meisner (1839) segregated this taxon from *Pratia* and accorded it generic rank as *Bernonia* (Endl.) Meisn.; however, no species-rank combinations were ever effected under this name. Candolle (1839) felt it inappropriate for

two genera to commemorate a single person (the honoree of both *Pratia* and *Bernonia* was a French naval officer named Prat-Bernon), so he substituted the name *Piddingtonia* A. DC. for the latter. As Candolle was unsure of the identity and generic placement of *Lobelia montana* (see above), it remained for Friedrich Miquel in 1857 to transfer that species to *Piddingtonia*. At the same time, he described a related species from Java, *P. patens*, and two years later, Hasskarl added another, *P. cyanocarpa*. The name *Piddingtonia* is illegitimate under Art. 52.1 (McNeill et al. 2006), and subsequent authors treated it as a synonym of *Pratia* (Bentham 1876; Baillon 1885; Hemsley 1886; Schönland 1889; Wimmer 1943).

About this same time, Joseph Dalton Hooker and Thomas Thomson were "obliged to found a new genus [that they named *Speirema*] upon a remarkable and handsome species from the Sikkim Himalaya," which they took to be conspecific with ("nullo modo differt") *Lobelia montana* of distant Java. The authors did not articulate exactly why this species could not be accommodated in *Pratia* or *Piddingtonia*, but one assumes it was largely a matter of habit. While their plant was a tall herb with divaricate branches a foot long, all other species then assigned to *Piddingtonia* and *Pratia* (cf. Hooker 1844, 1852) were much smaller plants with prostrate or decumbent stems. However, recognition of *Speirema* did not extend beyond the initial publication. Bentham (1876) discussed it briefly under *Pratia*, commenting that it differed solely by its taller habit and larger flowers. Baillon (1885) agreed and demoted it to sectional rank, a classification adopted by Hemsley (1886) and Schönland (1889).

In his monograph, Wimmer (1943, 1953, 1968) divided *Pratia* into two sections: *P.* sect. *Pratia* (including *Piddingtonia*) for the small usually prostrate or decumbent species, and *P.* sect. *Colensoa* (Hook. f.) Baill. (including *Speirema*) for the tall usually ascending or erect species. The latter section included not only the types of *Speirema* and *Colensoa* Hook. f. [*P. physaloides* (A. Cunn.) Hemsl. of New Zealand], but an additional ten baccate species of similar habit from southeastern Asia and the Neotropics.

Because the fleshy fruit of *Pratia* was the sole feature that consistently distinguished the genus from *Lobelia*, a given species of *Pratia* often had more in common with certain species of *Lobela* than it did with congeners. Such patterns often are an indication that the one genus is polyphyletic, stemming from disparate elements of the other. Consequently, taxonomists in the mid-Twentieth Century (summarized by Lammers 1993) began to question the wisdom of recognizing *Pratia*. This movement began with regional authors transferring their species of *Pratia* to *Lobelia;* Moeliono (1960) did so for the Asian species, including *L. montana*. Eventually, the two genera were fully merged by Murata (1995) and Lammers (1998). Wimmer's *Pratia* sect. *Pratia* became *Lobelia* sect. *Pratia* (Gaudich.) J. Murata [assigned to *L.* subg. *Mezleria* (C. Presl) E. Wimm.], while *P.* sect. *Colensoa* became *L.* sect. *Colensoa* (Hook. f.) J. Murata [assigned to *L.* subg. *Tupa* (G. Don) E. Wimm.]. Baccate fruit was no longer a distinguishing character, as each section also included capsular species.

In the most recent revision of *Lobelia* (Lammers 2010), *L.* sect. *Colensoa* was pared down to its type, *L. physaloides*. Most of the other species placed there by Wimmer and Murata were reassigned to *L.* sect. *Rhynchopetalum* (Fresen.) Benth. and *L.* sect. *Tylomium* (C. Presl) Benth., while *L. borneensis* (Hemsl.) Moeliono was segregated as *L.* sect. *Plagiobotrys* Lammers. *Lobelia montana* and four similar Asian species (*L. brevisepala*, *L. fangiana*, *L. longipedicellata*, and *L. reflexisepala;* cf. Lammers 2007a) then became *L.* sect. *Speirema*.

MATERIALS AND METHODS

Morphological data were gathered from approximately 150 specimens (including types) deposited in 15 herbaria (see Acknowledgments) and analyzed via traditional taxonomic methodology (Leenhouts 1968; Qualls 1986; Vogel 1987; Maxted 1992; Watson 1997; Winston 1999). Once taxa had been discerned in this fashion, they were compared to type specimens to determine the correct name under the *International Code of Botanical Nomenclature* (McNeill et al. 2006). Decisions on rank for the taxa were made in light of the definitions of species and subspecies I have employed previously (e.g., Lammers 1991, 2005, 2007a).

RESULTS AND DISCUSSION

This study supports the continued recognition of only three of the five species originally assigned to *Lobelia* sect. *Speirema* (Lammers 2010): *L. fangiana*, *L. longipedicellata*, and *L. montana*. *Lobelia brevisepala* and *L. reflexisepala* are here added to the synonymy of the last for the following reasons. First, the calyx lobe features used to distinguish them from sympatric *L. montana* are not likely to function in the enforcement of reproductive isolation. Second, these features are merely extremes in a continuum of variation; there are no gaps in the range of calyx lobe lengths nor in their posture. In fact, although widely distributed species often evince geographically correlated patterns of variation that make the recognition of subspecies possible, such was not the case with *L. montana* (cf. Barnesky & Lammers 1997; Thompson & Lammers 1997). The geographic origin of a specimen cannot be predicted on the basis of morphology.

This study also revealed that *Lobelia deleiensis*, treated as a synonym of *L. montana* (Haridasan & Mukherjee 1988; Lammers 2007a), differs consistently from that species in size of the corolla and staminal column and in color of the anther tube. Among Lobelioideae, differences of this sort often are correlated with pollinator differences and thus may be indicative of reproductive isolation (Wood 1961; Young 1982; Lammers & Freeman 1986; Lammers 1991, 1995, 2000, 2009; Sazima et al. 1994; Thompson & Lammers 1997; Muchhala 2003, 2006). For this reason, *L. deleiensis* is here accorded specific rank.

TAXONOMY

Lobelia sect. **Speirema** (Hook. f.) Lammers, comb. nov. *Speirema* Hook. f. & Thomson, J. Proc. Linn. Soc., Bot. 2:27. 1858.

Pratia sect. *Speirema* (Hook. f.) Baill., Hist. Pl. 8:366. 1885. TYPE [sub Art. 37.3]: *Speirema montanum* (Reinw. ex Blume) Hook. f. & Thomson.

Lobelia subsect. *Haynaldianae* E. Wimm., Ann. Naturhist. Mus. Wien 56:366. 1948. TYPE [designated by J. Murata, J. Fac. Sci. Univ. Tokyo, Sect. 3, Bot. 15:358. 1995.]: *Lobelia omeiensis* E. Wimm. Although Mabberley (1974) earlier designated *L. fistulosa* Vell. to stand as the type, so that this name might be applied to the Brazilian members of *L.* sect. *Rhynchopetalum* (cf. Lammers 2010), that species was not among those included in the protologue.

Plants perennial (hemicryptophytes or chamaephytes; *L. deleiensis* a rhizomatous geophyte), 0.3–2 m tall, terrestrial. Stems herbaceous or suffruticose, 2–8 mm diam., branched (commonly from base and sometimes above) or unbranched, erect, ascending, arching, or sprawling, glabrous (rarely scabrous or puberulent); latex acrid, viscous, white. Leaves alternate, simple, exstipulate, dorsiventral, pinnately veined (dillenid), petiolate (sessile in *L. fangiana*); lamina elliptic, oblong, lanceolate, oblanceolate, or ovate, chartaceous or subcoriaceous (fleshy in *L. longipedicellata*), glabrous (rarely puberulent when young, or sparsely scabrous on midrib below); margin callose-toothed, flat (revolute in *L. longipedicellata*); apex caudate, cuspidate, or acuminate; base rounded, obtuse, cuneate, or rarely attenuate; petiole (when present) winged, much shorter than the blade. Flowers tetracyclic, perfect, zoophilous, chasmogamous with a specialized method of proterandrous secondary pollen presentation, resupinate, epigynous, zygomorphic, pedicellate, solitary in the axils of little-reduced or unreduced leaves (in *L. fangiana* often supplemented by a terminal 10–25-flowered bracteate anauxotelic raceme); pedicels ascending, spreading, sigmoid, or incurved, 1/10–3/4 as long as the subtending leaf or bract, glabrous or puberulous, ebracteolate (in *L. longipedicellata* often with a pair of linear bracteoles in the lower third). Calyx synsepalous, radially symmetric, adnate to the ovary, forming an appendicular hypanthium 1/6–1/2 as long as corolla, glabrous (sometimes the tube short-pubescent on the nerves); base acute, obtuse, or rounded; lobes 5, valvate, lanceolate, triangular, or linear, 4/5–3 times as long as the hypanthium, erect, spreading, recurved, or rarely reflexed, the margin entire (in *L. fangiana* sometimes with 1–3 teeth per side), flat (revolute in *L. longipedicellata*), the apex acute or acuminate. Corolla early-sympetalous, valvate, bilaterally symmetric, sub-bilabiate with 2 dorsal lobes and a trifid ventral lip, dark violet, red-purple, bluish lilac, greenish, or cream-colored, the lip often contrastingly marked; tube straight, cleft to its base on the dorsal side, about as long as broad to 4¼ times longer than broad, pubescent within and sometimes without; dorsal lobes linear, linear-spatulate, or linear-triangular, a little shorter than the tube to 4⅓ times longer than the tube, apex acuminate; ventral lobes connate for 1/5–3/4 their length, free portion elliptic or lanceolate, apex caudate, acuminate, or acute. Stamens 5, antisepalous, connate distally,

forming a dorsally deflected staminal column exserted from the dorsal slit of corolla and free from the corolla tube; filament tube glabrous or pubescent; anthers tetrasporangiate, dithecal, basifixed, introrsely dehiscent by longitudinal slits, the dorsal three longer than the ventral two, forming a ventrally oblique gray or cream-colored tube occluded at the orifice, its dorsal surface glabrous or sparsely short-pubescent toward apex; dorsal anthers ⅔–1¼ times as long as the filament tube; ventral anthers bearded at apex with tufts of white filiform hairs; pollen grains tricolporate or tricolpate, prolate, ellipsoid, psilate. Gynoecium syncarpous, bilocular; ovary inferior; placentae axile, large; ovules numerous, small, anatropous, unitegmic, tenuinucellate; style solitary, slender, terete, with a ring of stiff white hairs below the apex; stigma bilobed, the lobes appressed and non-receptive as the style grows through the anther tube, pushing out pollen, after which the stigmas spread and become receptive. Fruit a black-purple to violet or greenish globose or obovoid berry. Seeds small, numerous, amber-colored or tan, broadly ellipsoid, subterete to slightly compressed or sometimes angular; testa striate-reticulate (Murata Type C), shiny or dull. Chromosome number unknown (Lammers 1993).

Distribution.—Endemic to southeastern Asia, from northeastern India and southwestern China to northern Vietnam, with disjunct populations of *Lobelia montana* on the Malay Peninsula, Sumatra, and Java.

KEY TO THE SPECIES OF *LOBELIA* SECT. *SPEIREMA*

1. Lamina fleshy, the margin revolute; pedicels 38–80 mm long, often with a pair of linear bracteoles 6–18 mm long in the lower third; calyx lobes 2.5–5 mm wide, the margin revolute (NE India)_____ **4. Lobelia longipedicellata**
1. Lamina chartaceous or subcoriaceous, the margin flat; pedicels 10–55 mm long, ebracteolate; calyx lobes 0.5–1.9 mm wide, the margin flat.
   2. Plants rhizomatous; corolla 12–18 mm long, tube 3–6 mm long; filament tube 6.5–8 mm long; anther tube cream-colored, the dorsal anthers 6–8 mm long, a little shorter to a little longer than the filament tube (NE India & SW Yunnan) _____ **3. Lobelia deleiensis**
   2. Plants lacking rhizomes; corolla (15–)18–26 mm long, tube 6–13 mm long; filament tube 8.5–12 mm long; anther tube gray, the dorsal anthers 4.8–7 mm long, 2/5–¾ as long as the filament tube.
      3. Stems sparsely to densely puberulent toward apex; leaves sessile; uppermost 10–25 flowers often subtended by bracts only ¼–1/10 as long as the foliage leaves, thus forming a terminal raceme; pedicels densely puberulous; hypanthium pubescent along the nerves; calyx lobes narrowly triangular or triangular, 1.2–1.9 mm wide, erect; corolla greenish with purple spots on lip; anther tube 1.4–1.8 mm diam, glabrous; trichomes at apex of ventral anthers 0.5–1 mm long (S Sichuan)_____ **1. Lobelia fangiana**
      3. Stems glabrous (rarely sparsely scabrous); leaves petiolate; all flowers subtended by unreduced foliage leaves; pedicels glabrous; hypanthium glabrous; calyx lobes linear or linear-triangular, 0.5–1.4 mm wide, ascending, spreading, or recurved; corolla dark violet or purple to bluish lilac, the lip often paler, or striped or blotched with white; anther tube 2–2.8 mm diam, its dorsal surface sparsely short-pubescent at least toward apex; trichomes at apex of ventral anthers 1–2 mm long (NE India & SW China to Java) _____ **2. Lobelia montana**

1. Lobelia fangiana (E. Wimm.) S.Y. Hu, J. Arnold Arbor. 61:90. 1980. *Pratia fangiana* E. Wimm., Repert. Spec. Nov. Regni Veg. 38:3. 1935. TYPE: CHINA. SICHUAN: [Omei-hsien, Mt. Omei, grassy slope, 8500–9000 ft, 12 Aug] 1928, *Fang 2853* (HOLOTYPE: NY! ISOTYPES: E! K!). The information in brackets is found only on the isotypes.

Lobelia omiensis E. Wimm., Ann. Naturhist. Mus. Wien 56:366. 1948. TYPE: CHINA. SICHUAN: Mt. Omi, *Wilson 5034* (HOLOTYPE: K!).

Stems 0.7–1.5 m tall, 4–8 mm diam., unbranched, erect, sparsely to densely puberulous toward apex. Leaves sessile; lamina elliptic, narrowly elliptic, narrowly oblong, or lanceolate, 5.5–16 × 1.2–3 cm, chartaceous or subcoriaceous, glabrous; margin callose-serrulate or rarely callose-crenulate; apex acuminate; base cuneate. Flowers solitary in the axils of little-reduced or unreduced leaves, and the uppermost 10–25 often aggregated into a terminal raceme; bracts of the latter lanceolate or narrowly elliptic, 8–45 × 1.2–9 mm, glabrous, the margin callose-denticulate, the apex acuminate; pedicels 12–38 mm long, ascending or spreading, equaling to ½ as long as its subtending bract, or ¼–1/10 as long as its subtending leaf, densely puberulous, ebracteolate. Hypanthium obconic or campanulate, 3–5(–7) × 3–5 mm, (⅙–)⅕–⅖ as long as corolla, short-pubescent on the nerves or sometimes glabrous; base acute or obtuse. Calyx lobes narrowly triangular or triangular,

3–7 × 1.2–1.9 mm, equaling to ½ again as long as the hypanthium, erect; margin entire or with 1–3 teeth per side; apex acuminate. Corolla red-purple or greenish with the lip purple-spotted, 18–23 mm long; tube 6–10 × 2.2–3.5 mm, 1¾–3¾ times longer than broad, sparsely pubescent within and without; dorsal lobes linear or linear-triangular, 10–14 × 0.5–1.5 mm, equaling to 2¼ times longer than the tube, apex acuminate; ventral lobes 8–11 × 1.5–2.8 mm, connate for ⅓–½ their length, the free portion lanceolate, apex acuminate. Filament tube 8.5–12 mm long, glabrous; anther tube gray, 1.4–1.8 mm diam., its dorsal surface glabrous; dorsal anthers 5–6 mm long, ½–⅔ as long as the filament tube; ventral anthers 4–4.7 mm long, bearded at apex with tufts of white hairs 0.5–1 mm long. Berry globose or obovoid, 7–17 × 8–12 mm. Seeds amber-colored, broadly ellipsoid, subterete, 0.6–0.7 × 0.3–0.4 mm; testa dull.

Distribution, habitat and phenology.—Endemic to south-central Sichuan, China. Moist thickets on slopes and riverbanks, 1750–2745 m. Flowering and fruiting August to September.

Icones.—Wimmer (1943), fig. 29j [as *Pratia fangiana*]; Wimmer (1953), fig. 99e [as *Lobelia omiensis*]; Murata (1995), figs. 62–63.

Vernacular name.—Chinese: e mei zi chui cao.

Discussion.—The sessile leaves of *Lobelia fangiana* as well as its tendency to produce a terminal raceme are not found in any other member of *L.* sect. *Speirema*. These features are, however, characteristic of *L.* sect. *Rhynchopetalum* (Fresen.) Benth., a taxon well represented in southeastern Asia (Lammers 2010), and *L. fangiana* may represent an early stage in the divergence *L.* sect. *Speirema* from *L.* sect. *Rhynchopetalum*. It is assigned here on the basis of its baccate (vs. capsular) fruit and terete non-winged (vs. lenticular winged) seeds.

Because the type of *Lobelia omiensis* lacked fruit, Wimmer did not compare it to the baccate *Pratia fangiana* that he had described from the same locality 13 years earlier. Instead, he described the new species as intermediate between (though not likely a hybrid of) *L. davidii* Franch. and *L. nicotianiifolia* Roth ex Schult., species currently assigned to *L.* sect. *Rhynchopetalum* (Lammers 2010). It was Hu (1980) who studied the relevant type material as well as subsequent collections from Omei-shan and realized that the two names denote a single species. That conclusion was supported in the present study.

Representative specimens: **CHINA. Sichuan:** Qinglongzui near site of Longwangmiao along the Longxi River, *Boufford et al. 24773* (CAS); Mt. Emei, Xixiang Lake, *Guan et al. 04120* (MO); Mt. Omei, *Yin 127* (US); Dujiangyan, Longxi-Hongkou National Nature Preservation Area, Mt. Guangguang, *Zhu et al. 930* (MO, OSH).

2. Lobelia montana Reinw. ex Blume, Bijdr. 728. 1826. *Pratia montana* (Reinw. ex Blume) Hassk., Cat. Hort. Bot. Bogor. 106. 1844. *Piddingtonia montana* (Reinw. ex Blume) Miq., Fl. Ned. Ind. 2:573. 1857. *Speirema montanum* (Reinw. ex Blume) Hook. f. & Thomson, J. Proc. Linn. Soc., Bot. 2:27. 1858. TYPE: INDONESIA. JAVA: *Reinwardt s.n.* (LECTOTYPE, here designated: L-0001668! ISOLECTOTYPES: L-0001686! L-0001689! NY!).

Piddingtonia patens Miq., Fl. Ned. Ind. 2:573. 1857. TYPE: "Java, op den G. Praoe (HORSF.)," not located.

Piddingtonia cyanocarpa Hassk., Bonplandia 7:179. 1859. *Pratia montana* var. *cyanocarpa* (Hassk.) E. Wimm., Pflanzenr. IV.276b:117. 1943. TYPE: not indicated.

Pratia montana f. *variegata* Hochr., Candollea 5:293. 1934. TYPE: INDONESIA: JAVA: Mt Salak versant W. au-dessus de Gœnœng boender, forêt, rives du Tjigamea, 1250 m, 2 Oct 1904, *Hochreutiner 1953* (HOLOTYPE: G; ISOTYPE: L!).

Lobelia wardii C.E.C. Fisch., Bull. Misc. Inform. Kew 1940:298. 1941. *Pratia wardii* (C.E.C. Fisch.) E. Wimm., Pflanzenr. IV.276c:833.1968. TYPE: INDIA. ARUNACHAL PRADESH: Delei Valley, 28°21'N 96°37'E, growing on the edge of thickets in the undergrowth, 5000 ft, 12 Jul 1928, *Kingdon Ward 8445* (HOLOTYPE: K! ISOTYPE: K!).

Pratia reflexa Y.S. Lian, Acta Phytotax. Sin. 17:123. 1979. *Lobelia reflexisepala* Lammers, Novon 8:34. 1998. Non *Lobelia reflexa* Stokes, Bot. Mat. Med. 1:342. 1812. TYPE: TIBET: Mo Tuo, 2700 m, *Qinghai-Xizang Exped. Team 74-3970* (HOLOTYPE: PE).

Pratia brevisepala Y.S. Lian, Fl. Reipubl. Popul. Sin. 73(2):189. 1983. *Lobelia brevisepala* (Y.S. Lian) Lammers, Novon 8:34. 1998. TYPE: CHINA. YUNNAN: Xichou, 1500–1600 m, *Feng 11936* (HOLOTYPE: PE).

Stems 0.5–2 m tall, 2–7 mm diam., commonly branched from base and sometimes above, erect, arching, sprawling, glabrous (rarely sparsely scabrous, or puberulent when young). Leaves petiolate; lamina elliptic, lanceolate, or ovate, 3.5–13 × 1.2–4.6 cm, chartaceous, glabrous (rarely puberulent when young, or sparsely scabrous on midrib); margin callose-serrulate, callose-denticulate, or callose-crenulate; apex caudate or sometimes merely acuminate; base cuneate, obtuse, or rounded; petiole 3–13 mm long. Flowers solitary in

the axils of little-reduced or unreduced leaves; pedicels 24–55 mm long, ascending, spreading, sigmoid, or incurved, 1/5–3/4 as long as its subtending leaf, glabrous, ebracteolate. Hypanthium globose or campanulate (rarely obconic), 3–6 × 3–5 mm, 1/6–3/10 as long as corolla, glabrous; base obtuse or rounded (rarely acute). Calyx lobes linear-triangular or linear, 2–14 × 0.5–1.4 mm, 4/5–2 2/3 times as long as the hypanthium, spreading, recurved, or rarely reflexed; margin entire; apex acuminate. Corolla dark violet to bluish lilac, the lip often paler, or striped, margined, or blotched with white, 15–26 mm long, long–pubescent within; tube 6–13 × 2.5–4 mm, 1 3/4–4 1/4 times longer than broad; dorsal lobes linear, 9–17 × 0.9–1.2 mm, equaling to 2 3/4 times longer than the tube, the apex acuminate; ventral lobes 7–15 × 2–5 mm, connate for 1/5–3/5 their length, the free portion elliptic, apex caudate. Filament tube 9–12 mm long, glabrous; anther tube light gray, 2–2.8 mm diam., its dorsal surface sparsely short-pubescent at least toward apex; dorsal anthers 4.8–7 mm long, 2/5–3/4 as long as the filament tube; ventral anthers 3.8–6 mm long, bearded at apex with tufts of white hairs 1–2 mm long. Berry violet to black-purple, globose, 6–15 × 7–19 mm. Seeds amber-colored, broadly ellipsoid, slightly compressed, 0.5–0.8 × 0.3–0.5 mm; testa shiny.

Distribution, habitat and phenology.—In three disjunct areas in southeastern Asia; the first overlaps the geographic distribution of *Lobelia deleiensis* and *L. longipedicellata*. *(1)* Northeastern India (Arunachal Pradesh) and Tibet to northeastern Burma. Thickets and openings in wet broadleaf and evergreen cloud forests at 1300–2135 m. Flowering July through November, fruiting August through April. *(2)* Southeastern Yunnan and northern Vietnam. Thickets and openings in wet broadleaf and evergreen cloud forests at 1300–2135 m. Flowering July through November, fruiting August through April. *(3)* The Cameron Highlands of the Malay Peninsula, and the Indonesian islands of Sumatra and Java. Wet montane rain and cloud forests, subalpine scrub forest, and meadows at 1000–3000 m. Flowering and fruiting primarily during the monsoon seasons: December through April and July through September. Map: Moeliono (1960), fig. 18 (solid line).

Icones.—Moeliono (1960), fig. 17; Wimmer (1968), fig. 14b [as *Pratia wardii*]; Academia Sinica (1979), fig. 153 1–2 [as *P. montana*]; Lian (1979), fig. 2 [as *P. reflexa*]; Lian (1983), pg. 170 [as *P. brevisepala*], pg. 172 [as *P. reflexa*]; Lian (1985), fig. 266 [as *P. reflexa*]; Haridasan & Mukherjee (1988), fig. 13; Murata (1992) figs. 25, 35, 39–40.

Vernacular names.—Chinese: shan zi chui cao. Indonesian: hi-leuntja. Sundanese: djanghe leuweung, djonghe rende.

Discussion.—Although type material of Javanese *Piddingtonia cyanocarpa* and *P. patens* was not available for study, these names are included in synonymy with confidence, following Moeliono (1960). Both were compared to *P. montana* by their authors, and in neither case have the alleged distinctions from that species held up following examination of a far larger body of material. As such, they are a parallel case to the synonymization of Chinese *Lobelia brevisepala* and *L. reflexisepala* (see above).

The name *Pratia montana* f. *variegata* was bestowed on plants with distinctive bicolorous corolla pigmentation. Judging from collectors' notes on specimens, floral color is quite variable within *Lobelia montana*, and as the observed variation is not correlated with geography nor with other morphological features, it does not merit nomenclatural recognition.

The type specimen of *Lobelia wardii* lacked fruit and so the possibility of a relationship to *L. montana* was not perceived by its author. Instead, it was compared (as were *L. deleiensis* and *L. longipedicellata*) to *L. erectiuscula* H. Hara, a species of *L.* sect. *Rhynchopetalum*. It was Wimmer (1968) who, in transferring the species to *Pratia*, first noted that it was very similar to *P. montana*. He nonetheless retained it as a distinct species by virtue of the peculiar ("eigentümliche") ventral lip of its corolla, though it is difficult to detect anything in his description of the novelty that differs from his earlier description of *P. montana* (Wimmer 1943). Haridasan and Mukherjee (1988) treated the name as a synonym of *P. montana*, commenting that "the distinguishing characters are too meagre." The present study supported their conclusion; the type of *L. wardii* could be matched by any number of specimens confidently assigned to *L. montana*.

Representative specimens. **INDIA. Arunachal Pradesh:** Mishme, *Griffith 3442* (K); Subansiri, 1 mi from Sayata, *Sastry 40782* (L). **BURMA. Kachin:** Htawgaw, *Forrest 24854* (K, US), *Forrest 24890* (US). **CHINA. Yunnan:** Mengtze [Mengzi], SW mts., *Henry 9370A* (E,

MO, US), *Henry 9370B* (K, NY). **VIETNAM. Lào Cai:** Env. du Cha-pa [Sa Pa], Apr 1909, *d'Alleizette s.n.* (L); Hoang Lien National Park, trail to Phang Xi Pang peak, *Atha et al. 4867* (BRIT, NY); Lo Qui Ho, environs de Chapu [Sa Pa], *Petelot 5097* (NY, US). **Hà Giang:** Vi Xuyen, Cao Bo, Tam Ve, *Harder et al. 5424* (MO). **Cao Bằng:** Nguyen Binh, ca. 41 km W of Cao Bằng, *Averyanov et al. CBL 037* (MO), *Averyanov et al. CBL 202* (MO). **MALAYSIA. Pahang:** Mt. Brinchang, 47 mi. from Tapah, *Abbe & Abbe 10287* (K, NY); Gunong Brinchang, *Chew 920* (K, L); Cameron Highlands, *Henderson 23296* (K, NY); Brinchang Mt., *Klackenberg & Lundin 748* (S); between Gunong Brinchang and Green Cow Area, *Shimizu et al. 13453* (L); Gunong Batu Brinchang, roadside above ¼ mi from summit, *Sinclair 9953* (L, NY); Gunong Brinchang, *Turnau 802* (K); Gunong Brinchang, W of Tanah Rata, *Woods et al. 682* (L); Gunong Brinchang, *Worthington 12635* (BRIT, L, NY). **INDONESIA. Sumatra:** Tapanuli, near Baniara, S of Sidikalang, *Alston 15040* (L); trail from Medan Road to top of Sibajak volcano, *Bangham & Bangham 1054* (K, NY); Karoland, Dĕlĕng Si Bajak, *Bartlett 6513* (NY); Karoland, Dĕlĕng Si Naboen, *Bartlett 8625* (NY); Abita, Sul Me. Singalan, (alto Padang), *Beccari 53* (K, L); Toba, vicinity of Loemban Loboe, *Boeea 10415* (L); Asahan, Aek Si Oelak, *Boeea 11221* (L); G. Merapi, *Bünnemeyer 4577* (L); G. Falang, Pad Bovenlanden, *Bünnemeyer 5503* (L); G. Koerintji, *Bünnemeyer 9663* (L); G. Koerintji, *Bünnemeyer 10420* (K); Lae Pondom, 28 km E of Sidikalang, *Dunselman 9* (L); Sibajak, *Lörzing 13543* (L); Gunong Singgalan, 16 Jan 1913, *Matthew s.n.* (K); Mt. Kerintji, G. Tudjuh crater ridge, *Meijer 6564* (L); summit of Gunung Talang, Kabupaten Solok, *Nagamasu 3443* (L); Schagak volcano, Berastagi, 11 Feb 1921, *Ridley s.n.* (K); montis Singalang, *Schiffner 2727* (L), *Schiffner 2729* (L), *Schiffner 2734* (L); montis ignivomi Merapi, *Schiffner 2735* (L); summit of Mt. Goh Pemboek, *Steenis 9116* (L); Atjeh, Gajolanden Sanger Valley above Blang Kedjeren, *Steenis 9858* (L); W side Mt. Marapi, *Borssum Waalkes 2215* (L); Atjeh, Gunung Bandahara, ca. 25 km NNW of Kuktatjane, *de Wilde & de Wilde-Duyfjes 13303* (K, L); Gunung Batu Lopang, ca. 10 km ESE of Prapat (Lake Toba), *de Wilde & de Wilde-Duyfjes 13512* (L); Atjeh, Upper Mamas River, ca. 15 km W of Kutacane, *de Wilde & de Wilde-Duyfjes 19099* (L); east coast, *Yates 1503* (B, NY); Fort de Kock, Mt. Singgala, *Yates 2460* (B, NY). **Java:** Mt. Malabar, *Anderson 281* (K); Preanger, Papandajan oostzyde, *Backer 5527* (L); Preanger, Faloen, *Backer 5660* (L); Rantja Walini, *Backer 12584* (L); G. Gedeh boven Tjibodas, *Backer 13550* (L); Petaeng Kriâná, *Backer 15025* (L); Dieng plateau, *Backer 21673* (L); sine loc., s.d., *Blume s.n.* (NY); Preanger, Bosschen van Malabar, *Denker 22* (L); Tjibodas, Tjurug, Tjikundul, *Enoh 26* (L); Tjibeureum, Mt. Gede, *Forman 105* (K, L); slopes of Volcano Gedeh below Gedeh-Pangorango Saddle toward Tjibodas, *Fosberg 44642* (NY); mt Guedéh, en montant à Kandang badak, *Hochreutiner 1047* (L); Dieng, G. Prahoe, *Karsten 24* (L); Mt. Gedeh above Tjibodas, *Kern 8309* (L); G. Papandajan, Mar 1930, *Kjellberg s.n.* (S); Preanger, G. Papandajan, *Koorders 41300* (L); Gede, *Kuntze 4618* (NY); Dieng, *Kuntze 5701* (NY); Région de Bogor, Volcan Pangrango, *Lisowski 53241* (WAG); sine loc., 1846, *Lobb 107* (K); Tjibodas, Tjipanas, *Main 328* (K, L); Mt. Gede, Tjibeureum, *Meijer 1602* (L); G. Malabar, Poentjak gede, *Monterie 38* (L); Cibodas, pentes du Gunung Gedè, *Raynal 18905* (MO); Tjibodas, Kandang Badak, *Reijnvaan 37* (L); N side of Gedeh-Rangrango massif, 30 km SE of Bogor, *Sands 49* (K); Tjibodas, 27 Oct 1966, *Schwabe s.n.* (B); sine loc., s.d., *Siebold s.n.* (M); Dieng plateau, S of Sikidang crater, ca. 2 km S of Dieng, *Wieringa 1919* (K, WAG).

3. Lobelia deleiensis C.E.C. Fisch., Bull. Misc. Inform. Kew 1940:297. 1941. *Pratia montana* var. *deleiensis* (C.E.C. Fisch.) E. Wimm., Pflanzenr. IV.276c:833. 1968. TYPE: INDIA. ARUNACHAL PRADESH: Delei Valley, 28°21'N 96°37'E, 6000–7000 ft, 16 Jul 1928, *Kingdon Ward 8460* (HOLOTYPE: K-000575349! ISOTYPE: K-000575348!).

Rhizomatous perennial. Stems 0.5–2 m tall, 2.3–7 mm diam., often branched from base and sometimes above, erect or arching, glabrous. Leaves petiolate; lamina elliptic or lanceolate, 6–14 × 1.4–4.2 cm, chartaceous or subcoriaceous, glabrous; margin callose-denticulate, callose-serrulate, or callose-crenulate; apex caudate; base cuneate or obtuse; petiole 3–18 mm long. Flowers solitary in the axils of little-reduced or unreduced leaves; pedicels 16–45 mm long, sigmoid or incurved, ⅕–⅖ as long as its subtending leaf, ebracteolate. Hypanthium campanulate or obovoid, 4–7 × 4.5–8 mm, ¼–½ as long as corolla, glabrous; base obtuse or rounded. Calyx lobes linear or linear-triangular, 5–17 × 0.5–0.9 mm, equaling to 3 times longer than the hypanthium, spreading or recurved; margin entire; apex acuminate. Corolla cream-colored or greenish with purple or blue markings on lip, 12–18 mm long; tube 3–6 × 3–4 mm, about as long as broad to twice as long as broad, pubescent within; dorsal lobes linear or linear-spatulate, 9–14 × 0.8–1.5 mm, 1¾–4⅓ times longer than the tube, the apex acuminate; ventral lobes 8–11 × 1.5–2.7 mm, connate for ⅕–⅖ their length, the free portion narrowly elliptic, the apex caudate. Filament tube 6.5–8 mm long, glabrous or sparsely pubescent; anther tube cream-colored, 2.3–3 mm diam., its dorsal surface glabrous or sparsely short-pubescent toward apex; dorsal anthers 6–8 mm long, 7/8–1¼ times as long as the filament tube; ventral anthers 4–6 mm long, bearded at apex with tufts of white hairs 0.8–2 mm long. Berry greenish, globose, 8–11 × 9–12 mm. Seeds tan, broadly ellipsoid, slightly compressed, 0.6 × 0.4 mm; testa dull.

Distribution, habitat and phenology.—Northeastern India and southwestern Yunnan. Evergreen broadleaf forest, 1525–2440 m. Flowering July–November, fruiting August–April.

Icones.—Wimmer (1968), fig. 14a [as *Pratia montana* var. *deleiensis*].

Discussion.—As with *Lobelia wardii*, the type of *L. deleiensis* lacked fruit and was compared by its author to *L.* (sect. *Rhynchopetalum*) *erectiuscula* instead of *L. montana*. Again it was Wimmer (1968) who, in transferring

the name to *Pratia*, first perceived a relationship, treating the taxon as *P. montana* var. *deleiensis*. Haridasan and Mukherjee (1988) did not recognize this variety, commenting that "the distinguishing characters are too meagre." However, this is not in fact the case. In this study, I examined numerous specimens from northeastern India and southwestern Yunnan that conform to the type of *L. deleiensis*; in fact, the specimens that inspired Hooker and Thomson (1858) to segregate *L. montana* as the genus *Speirema* were among them. Although Hooker and Thomson regarded these plants as identical to *L. montana* ("nullo modo differt"), they do differ by a suite of floral features that reasonably may be assumed to confer reproductive isolation (see above). For this reason, these plants are accorded specific rank.

One gathering from western Yunnan [*Forrest 25183*, E, K, US] deviates somewhat from the suite of features typical of *Lobelia deleiensis*, suggesting the possibility of introgression or incomplete divergence from *L. montana* and/or *L. longipedicellata*. Character states suggesting the influence of *L. longipedicellata* include the increasing length of the pedicels (up to 60 mm), the increasing diameter of the hypanthium (8–9 mm), the wider (1.5–1.7 mm) subulate calyx lobes, and the stouter corolla tube (length 1½–2¼ times width). Character states suggesting the influence of *L.montana* include the slightly longer corolla (19–20 mm), the stouter corolla tube mentioned previously, the longer filament tube (7–9 mm) equaling to 1/3 again as long as the dorsal anthers, and the larger berries (15–16 × 15–16 mm) containing larger seeds (0.7–0.8 × 0.4–0.5 mm).

Representative specimens: **INDIA. Sikkim:** "reg. temp.," *d'Alleizette 4260* (L); Rungjo, *Gamble 2325A* (K); "East Himalaya," *Griffith 3442* (P); "Regio temp.," s.d., *Hooker s.n.* (K, L, M, NY, S, US); Sinchul, *Kuntze 6706* (NY); above Rhikisum, *Lacaita 15846* (P); Toong, *Meebold 15808* (S); sine loc., *Native Collector 194* (M); sine loc., s.d., *Thomson s.n.* (L). **West Bengal:** Singmari, 14 Mar 1938, *Biswas s.n.* (US); Rungbee, *Clarke 8657* (K, L). **Nagaland:** Naga Hills, Pulebudze, *Bor 6361* (K). **Manipur:** "East Bengal," *Griffith 3442* (P); Sirhoi, *Kingdon Ward 17278* (NY). **CHINA. Yunnan:** Fugong Xian, Lishadi Xiang, Yaduo Cun, vicinity of Mabiluo, N fork of Yamu He, *Gaoligong Shan Biodiversity Survey 26788* (OSH); Fugong Xian, Lumadeng Xiang, Yaping Cun, below old Shibali , S fork of Yuma He, *Gaoligong Shan Biodiversity Survey 28725* (OSH), *Gaoligong Shan Biodiversity Survey 28799* (MO); Gongshan, Cikai Zheng, W of Gongshan along the Pula He between Qiqi bridge and Qiqi, *Li Heng 12178* (MO); Kiukiang-Taru divide, Lungnan, *Yü 20020* (E).

4. Lobelia longipedicellata C.E.C. Fisch., Bull. Misc. Inform. Kew 1940:298. 1941. *Pratia longipedicellata* (C.E.C. Fisch.) E. Wimm., Pflanzenr. IV.276c:833. 1968. Type: INDIA. Arunachal Pradesh: Delei Valley, 28°21'N 96°37'E, 6000–8000 ft, on south-facing scarped bracken-clad slopes where it grows in clumps, 9 Jul 1928, *Kingdon Ward 8443* (HOLOTYPE: K-000575355! ISOTYPES: K-000575352! K-000575353! K-000575354!).

Stems 0.3–1 m tall, 4–8 mm diam., commonly branched from base and sometimes above, erect, glabrous. Leaves petiolate; lamina elliptic or narrowly elliptic (oblanceolate toward base of plant), 6–15 × 1.3–3.6 cm, fleshy, glabrous; margin revolute and minutely callose-denticulate or callose-serrulate; apex caudate or cuspidate, sometimes merely acuminate; base cuneate or attenuate; petiole 3–5 mm long. Flowers solitary in the axils of little-reduced or unreduced leaves; pedicels 38–80 mm long, sigmoid, ⅓–⅔ as long its subtending leaf, often bibracteolate in the lower third; bracteoles linear, 6–18 × 0.7–1.8 mm. Hypanthium obovoid or obconic, 5–9 × 5.5–7 mm, 3/10–½ as long as corolla, glabrous; base acute or obtuse. Calyx lobes narrowly triangular or lanceolate, 9–22 × 2.5–5 mm, 1¾–2½ times longer than the hypanthium, erect; margin entire, revolute; apex acute or acuminate. Corolla dark magenta, 14–18 mm long; tube 5–9.5 × 3 mm, 2⅔ times longer than broad, pubescent within; dorsal lobes linear-triangular, 8.5–12 × 0.7–0.9 mm, a little shorter than the tube to ½ again as long, apex acuminate; ventral lobes 9–10 × 3–3.3 mm, connate for ½–¾ their length, the free portion elliptic, apex acute. Filament tube 7–8 mm long, short-pubescent in lines; anther tube light grey, 2.5–2.8 mm diam., its surface glabrous; dorsal anthers 5–7 mm long, ⅘–9/10 as long as the filament tube; ventral anthers 4–5 mm long, bearded at apex with tufts of white hairs 0.5–1 mm long. Berry globose, 8–9 × 10–12 mm. Seeds amber-colored, broadly ellipsoid, angular, 0.5–0.6 × 0.3–0.4 mm; testa shiny.

Distribution, habitat and phenology.—Known only from the type.

Icones.—Wimmer (1968), fig. 14c [as *Pratia longipedicellata*].

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